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Measuring Tea Farmers' Perceptions of Sustainable Agriculture and Factors Affecting This Perception in Rize Province of Turkey

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ABSTRACT

Sustainable agriculture highly depends on the actions taken by the farmers and their ability to make a decision by using their knowledge and information efficiently. Therefore, farmers' perception needs to transfer from a technocratic approach to a social approach for promoting sustainable agriculture. This study was planned to analyze the tea growers' perception of sustainable agriculture in Rize Province. For this reason, a stratified sample of 138 tea farmers was contacted to get their perceptions about predefined sustainable farming practices. A total of 60 items were factor analyzed and ultimately 33 items in four main factors, namely, policy, social, environmental, and economic were identified to construct a sustainability perception index. Considering this index score, farmers' perceptions were divided into three groups including low, medium, and high-level perception. The explanatory variables were selected from the socioeconomic characteristics and communication behavior of farmers. The model results showed that education level, age, participation in farming events, watching television, and using the internet affected farmers' perception of sustainable farming in the region. Government should focus on policy-related issues like illegal tea entry, social factors like increasing the communication and socialization level among stakeholders, and environmental problems as a result of farm practices through arranging appropriate workshops.

Keywords: *Camellia sinensis*, Ordered probit model, Tea growers.

INTRODUCTION

Tea (*Camellia sinensis*) is a small bush-type tree from the Theaceae family that grows in moist climates. The main homeland of the Theaceae family is the Nayland, Manipur, and Lushai hills extending along the Assam-Burma border in the west, China in the east, and the Burma and Thailand hills in the south. Turkey ranked fifth in the world in per capita tea consumption and sixth regarding tea production. It occupies a prominent place in social life as well as in economic life, because it is a source of income for about one million people living in the Eastern Black Sea region of Turkey (ul Haq and Boz, 2018).

Concerns raised by individuals and experts stress the importance that the present agricultural policies do not provide sustainable agriculture in the locality, which is assumed to be environmentally friendly, socially acceptable, and economically viable (Boz, 2018; Yüksek *et al*., 2013).

To adopt and implement sustainable farm technologies, the farmers need to believe that their adopted technologies are crucial to meet their current needs without compromising the ability of future generations to fulfill their own needs (Hayran *et al*., 2018). Adoption of sustainable agricultural practices is

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theoretically affected by the basic characteristics of an innovation, which were described by Rogers (2010) as relative advantage, compatibility, complexity, trialability, and observability. This theory suggests that, if an agricultural innovation provides benefits as lowering the costs or increasing profit margins; suitable with socio-economic and socio-cultural values and beliefs of farmers; easily understandable and practicable, can be applied to a limited part of the land or a certain number of livestock; and its results are observable by potential adopters, this innovation has a high possibility of being adopted by the potential adopters. The Theory of Planned Behavior (TPB) developed by Ajzen and Fishbein (2005) has been also largely utilized to determine the adoption behaviors of farmers (Adnan *et al*., 2018). According to this theory, an individual's behavior, attitude toward behavior, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions and behaviors.

Thus, sustainable farm production generally depends on the action taken by the farmers and their ability to make decisions, given their knowledge and information. Besides the agronomic and ecological perspectives of agriculture, it is also considered as a social activity for which farmers get along with rural society and make decisions for their families. Therefore, the goal of sustainable farming can be reached by farmers who use their knowledge and information more effectively (Shiri *et al*., 2012), and sustainable farming perception affects the adoption of sustainable farm practices positively (Van Thanh and Yapwattanaphun, 2015). Thus, perception should be shifted from the technocratic approach to the social negotiation process to promote sustainable agriculture, which can no longer ignore the humans in their social systems. The technocratic approach in tea farming can be the predominantly governmental policies such as tea purchasing quotas applied in every production season, purchasing price determination by governmental authorities, which are always found low by the producers, and restrictions of tea plantation areas by regions (Official Gazette, 2012). The social approach, on the other hand, would provide mutual understanding, develop good relationships and commitment among stakeholders including tea producers, processor companies, personnel of the Ministry of Agriculture and Forestry, and even consumers. For these reasons, besides the agricultural and ecological sciences, social sciences should also take part to analyze the human dimension, which is crucial in achieving the ultimate goal of agricultural sustainability (Karami and Keshavarz, 2010). Moreover, some studies described that the perceived importance of sustainable agriculture differs from farmer to farmer (van Thanh *et al*., 2015). Therefore, examining the perception of farmers regarding sustainable agriculture and exploring the factors affecting their perceptions are critical to design and execute policy and extension programs for enjoying sustainable agriculture (Tatlidil *et al*. 2009).

Literature provides that there have been different perception studies in Turkey focusing on education (Sak, 2018; Kan, 2015; Deniz and Hamarta, 2013) and social behavior sciences (Kuzgun *et al*., 2010); however, there have been quite limited studies in farmers' perception of sustainable agriculture. Tatlidil *et al*. (2009) developed a sustainable farming perception index for Kahramanmaraş Province farmers in Turkey and found that the higher the socio-economic status (more frequent contact with extension services, higher education, ownership of land, etc.) and the greater the access to information, the greater the perceived importance of sustainable agricultural practices. Another study conducted in Mersin Province of Turkey (Hayran *et al*., (2019) used a similar method and found that farmers had favorable perception regarding sustainable agricultural practices such as protection of agricultural resources, negative effects of agrochemicals on human health and the environment, use of on-farm inputs, crop rotation, and minimum tillage.

A study conducted by Bagheri (2010) found that potato farmers operating in Ardabil Province of Iran had a high perception of resource conservation, adverse effects of agrochemicals, and pests' invasion caused by successive cultivation; moderate perception of adverse environmental effects of modern agricultural technologies; and low perception on adverse long-term effects of agrochemicals on-farm productivity, and minimal tillage applications. Another study conducted in Iran (Hosseini *et al*, 2011) found that economic factors had more influence on farmers' perception of sustainable agriculture as compared with other factors. Kabir and Rainis (2012) investigated farmers' perceptions of the adverse effect of pesticides in Bangladesh and found that only a small portion (13.9%) of farmers had high perception and this was influenced by extension contact, experience in vegetable farming, education, and the training received on Integrated Pest Management (IPM). Another study conducted in Bangladesh (Farouque, 2007) showed low perceptions among farmers on the preparation of farmyard manure, integrated soil fertility, and nutrient management for sustainable crop production. Farmers' perception was positively influenced by education level, farming experience, farm size, and communication; and negatively influenced by family size and fertilizer use. Duruiheoma *et al*. (2015) identified UK farmers' perception of soil focusing on soil description by farmers, perceived benefits of soil, soil conservation, and organic fertilizers.

Several studies conducted in Africa revealed similar results about farmers' perceptions of sustainable agriculture. Adeola and Adetunbi (2015) found a favorable perception among the South-Western Nigerian farmers regarding sustainable agriculture, as they believed it would become a good alternative to industrial farming by increasing profit and generating farm income. Kemausuor *et al*. (2011) measured farmers' perception of climate change in the Ejura-Sekyedumase District of Ghana and found that a large majority of farmers believed that there had been climate change in the district that negatively affected farming. A study conducted in the Rulindo District of Rwanda (Muhamadi and Boz, 2021) found a significant effect of generating income from farming, participation in farming events, and receiving training on the perception of organic tea farming. Most of the aforementioned studies that focused on farmers' perception of sustainable agriculture stressed the importance of implementing adequate agricultural policies and developing effective extension programs to enhance farmers' perception towards agricultural sustainability.

Based on the given backdrop, the present study planned to examine the tea growers' perception of sustainable agriculture and identification of communication behavior and socioeconomic factors determining such perception or awareness. The importance of reviewing the subjective perception arises since it is considered to contain the goals including those achieved and those yet to be achieved. The perception is also looked up as a guiding concept of behavior and decision-making.

The specific objectives of the present work included the following:

1. Determine if any common factors can be identified among the selected items related to the sustainability of tea farming.
2. Develop an indicator regarding farmers' perceptions of sustainable agriculture.
3. Determine factors affecting farmers' perceptions of sustainable agriculture.
4. Develop recommendations for all stakeholders involved in tea farming in Rize Province of Turkey.

MATERIALS AND METHODS

Population and Sampling

The target population, to whom the findings of this research can be generalized, is all tea farmers operating in Rize Province of Turkey. Initially, three districts, namely, the

central district, Pazar, and Ardeşen Districts of Rize Province, and three villages from each district (a total of nine villages) were determined based on their agricultural potential, proximity to the city center, socioeconomic status of the village, and the number of family farms operating in the village. Considering these criteria, not only similar villages but also different villages were included in the sample. For example, while villages with high agricultural potential were included, villages with medium and low agricultural potential were also included. The same method was applied with proximity as both far and near villages were selected. Regarding the socioeconomic characteristics, considerable richer and poorer as well as more educated and less educated villages were selected. The number of family farms was the last criterion for which villages having large and small numbers of family farms were represented. Because all farmers in the locality specialized in tea farming and more than 90% of the cultivated areas are under tea production, they can be called tea farms (MFAL, 2017). In summary, the rationale behind this selection was that the sample should represent the average village and average family farm considering the above criteria. The selection of the districts and villages was made with the help of the provincial directorate of the Ministry of Food Agriculture and Livestock (MFAL). The lists of all farmers and their farm sizes were obtained from the Farmers Registration System of the MFAL, and this made the accessible population (1647 tea growers) of the research. Then, using Yamane's (2001) stratified sample size determination formula, the final sample size was drawn to represent the target population of this study. An extensive description of this method can be found in Boz and Akbay (2005). The stratified sampling formula is given below.

$$n = \frac{N \sum N_h S_h^2}{N^2 D^2 + \sum N_h S_h^2}, \; D^2 = \frac{e^2}{t^2}$$

n= Sample size
N= Population of tea growers in the main strata
N_h = Number of tea growers in each stratum
S_h= Standard deviation within each stratum
D^2= Expected variance
e= Accepted error from mean
t= t value corresponding to the accepted confidence interval.

At 95% confidence interval, and 3% acceptance of variance from mean, the formula resulted in a final sample size of 138 tea growers. Subsequently, this number was proportionately distributed among all strata to determine the farmers' number from each stratum.

Data Collection

The data collection instrument was prepared considering the recent trends and developments in agricultural structures and policies affecting tea farming in the region, as well as earlier work of Tatlıdil *et al*. (2009). The recent trends and developments include farmers' increasing use of chemical fertilizers, devoting farmland for other purposes and land fragmentation, not taking adequate measures for sustainability, and, therefore, a tendency of migrating from rural areas to large cities. The questions included in the data collection instrument were prepared considering the objectives of this study. For this reason, socioeconomic variables such as age, education, farm size, and land tenure were included in the first section. Sixty statements regarding sustainability were included in the second section on a five-point Likert scale. The last part of the questionnaire included questions about the communication behavior of farmers. Technically, it included three different types of questions as Likert type, continuous, and categorical questions. The content validity of the instrument was assessed by a panel of experts including college professors and agricultural professionals. Reliability for the Likert-type items was established by calculating the Cronbach's Alpha internal consistency coefficient, which was 0.86. Slight changes were made in the wording of some questions

after conducting a pre-test to check if the questions of the instrument were understandable by the respondents.

Data Analysis

To achieve the first objective of this study, a total of 54 items were determined considering earlier work in the field, specific agricultural features and socioeconomic characteristics of the region, and opinions of subject matter experts familiar with the region. These items were asked in a five-point Likert scale (1= Not important at all, 2= Not important, 3= Somewhat important, 4= Important, 5= Very important) and factor analyzed.

The mathematical model of factor analysis is explained by the following formula (Ness, 2002):

X1 = b11 f1 + b12 f2 +……. + b1k fk + u1
X2 = b21 f1 + b22 f2 +……. + b2k fk + u2
.
.
Xp = bp1 f1 + bp2 f2 +……. + bpk fk + up

Where, f_k shows factor weight in the measurement of pth variable of Kth factor, b_{pk} explains the correlation between the pth variable and Kth factor (factor loading) and u_p means unexplained variation by a factor. The extraction and rotation methods were principal component analysis, and varimax with Kaiser Normalization, respectively.

A total of 33 items were obtained through rotation converged in five iterations, and these were grouped as the underlined factors of policy (16 items), social (7 items), environmental (6 items), and economic factors (4 items). The remaining 27 items didn't go well with these 33 items, and they were excluded from the further data analyses.

To achieve the second objective of the study, a sustainability perception index was developed with the 33 remaining items from the factor analysis procedure regarding their Likert scale answers (the lowest score was 33 (33×1), and the highest score was 165 (33×5). Considering the frequency distribution of the sustainability perception index, farmers were divided into three groups of sustainability perception: Lower perception category who had a sustainable index score lower than 110 (24 farmers, 17.4%), medium perception category with a range of 110-120 index score (41 farmers, 29.7%), and higher perception category with sustainable index score greater than 120 (73 farmers, 52.3%). These groups were used as the dependent variable of the ordered probit model that was constructed to achieve the third objective of this study.

The dependent variable was coded as 0= Farmers in the lower perception category, 1= Farmers in the medium perception category and 2= Farmers in the higher perception category in the ordered probit model is articulated as:

$y^* = \beta' x_i + \varepsilon, \varepsilon \sim N(0,1)$
$y = 0$ if $y^* \leq 0$
$y = 1$ if $0 < y^* \leq \mu_1$
$y = 2$ if $\mu_1 < y^* \leq \mu_2$

Where, y*= Dependent variable as the probability of farmer belonging to a perception category; β'= Vector of coefficients; xi= Vector of explanatory variables; ε= Vector of normally distributed error terms [0, 1]; y= The observed dependent variable as the probability of farmers having a higher perception level of sustainable agriculture, and μ= The cutoff points which indicates the level of inclination of a farmer to have a higher perception of sustainable agriculture. It explains if there is a natural ordering among the three categories of the dependent variable.

The marginal effects were measured by using the following formula proposed by Chen *et al*. (2002). The purpose of calculating the marginal effects was to analyze how much each explanatory variable increase or decrease the probability of a farmer in each of the three categories of the dependent variable.

$$\frac{\partial P(y_i = j)}{\partial x_k} = \left[\Phi\left[\mu_{j-1} - \sum_{k-1}^{k} \beta_k x_k\right] - \Phi\left[\mu_j - \sum_{k-1}^{k} \beta_k x_k\right]\right]\beta_k$$

$\partial P/\partial x_k$ is a partial derivative of probability with respect to the independent variable x_k.

The positive value of the marginal effect of x_k explains that the probability of a farmer selecting the specific category increases with x_k and vice versa. Research data were first checked for the assumptions of model specification error and parallel regression. Since the assumptions were not violated, the data were subject to further analyses to achieve the objectives of this study.

RESULTS AND DISCUSSION

Identified Factors among the Selected Items Related to the Sustainability of Tea Farming

The farmers' perceptions of sustainable agriculture section of the measuring instrument in this study consisted of 33 items. Calculations of correlations and differences between each of these items individually and finding relationships with the selected demographics would be cumbersome to interpret. It may also create a high level of inflation of experiment-wise error (alpha level). Therefore, the scale was factor analyzed to determine if common factors could be identified in the data.

Results of factor analysis revealed four factors in the farmers' perceptions of sustainable agriculture. These factors, as labeled by the researcher, and the percentage of variance explained are presented in the following factor analysis section. The items included in each factor, and the order that they were extracted in, are also represented in the factor analysis section. The rotated component matrix for farmers' perceptions of sustainable agriculture statements is presented in Table 1. All four factors explained 55.24% of the variance, while the policy factor alone explained 21.15% of the total variation. This was followed by the social factors (13.35%), environmental factors (11.59%), and economic factors (9.14%), respectively.

According to farmers' responses on the Likert scale items, the policy-related issues were the most crucial factor for sustainable tea farms in the region. Among the items covered by this factor, farmers gave higher priority in supporting research for improving the quality of tea, provision of fast and sound purchasing and processing system of harvested green tea leaves without delay, establishing proper storage facilities, and providing governmental support for tea production, etc. In the social dimension, the tea growers perceived that good communication among all stakeholders is essential to provide social sustainability. The prevention of erosion in sloppy and hilly areas/lands, building solid trenches along the roads to control rainy water, being able to fight diseases affecting tea production, and tree planting in the area of erosion and landslide risk, etc. were the items in environmental factor that received more importance by tea growers. The last factor was economic, which describes the items regarding the willingness of the farmers to continue tea farming in the absence of purchasing guarantee by the government, and fertilizer/credit support. These items explain that tea farming is economically sustainable when growers are willing to continue tea farming without expecting any support.

Table 1. Factor analysis of farmers' perceptions of sustainable agriculture statements.[a]

	Factors and related items	Components			
	A. Policy factors	1	2	3	4
1	Supporting research and development to improve the quality of tea production	0.7634			
2	Improving the technology of processing	0.7446			
3	Organizing campaigns to raise awareness about domestic products	0.7402			
4	Packaging, standardizing and distribution of tea products in time.	0.7289			
5	Modernization of the packaging facilities.	0.7270			
6	Searching the reasons for illegal tea consumption.	0.7005			
7	Proper storage of processed tea products.	0.6644			
8	Preventing illegal entries of tea products.	0.6635			
9	Considering regional consumers' tastes and preferences when processing tea products.	0.6586			
10	Improving municipal services of roads, water, electricity, etc. in the region.	0.6302			
11	Providing extension and training services regarding tea farming.	0.6002			
12	Processing fresh tea leaves as soon as harvested.	0.5871			
13	Supporting rural investments in the region.	0.5735			
14	Developing a fast operating system from harvesting to processing.	0.5599			
15	Increasing governmental supports for tea production.	0.5047			
16	Purchasing tea products from farmers as soon as harvested.	0.5028			
	B. Social factors				
1	Social interactions and developing a good relationship with the fresh tea purchasing centers.		0.7939		
2	Excellent communication and relationships among farmers.		0.7924		
3	Establishing good relationships with the personnel of tea factories.		0.7663		
4	Establishing good relationships and communication with input dealers.		0.7590		
5	Communication with leader farmers and opinion leaders in the village.		0.7389		
6	Communication with the personnel of the district directorate of the extension services		0.7058		
7	Good relationships with the chamber of farmers in the district.		0.5975		
	C. Environmental factors				
1	Taking adequate measures to prevent erosion in sloppy lands and roadsides.			0.7387	
2	Building solid gutters and trenches along with roads, to control rainwater.			0.7229	
3	To be able to fight enough with the diseases affecting tea production.			0.7056	
4	Tree planting or growing perennial crops in the areas of risk of landslides and erosion			0.6918	
5	Not growing fruit trees in the tea garden			0.6644	
6	Proper route selection of the roads, water, electricity, telephone, natural gas, etc. facilities passing through agricultural land.			0.5938	
	D. Economic factors				
1	Willingness to continue production even without fertilizer support.				0.8962
2	Willingness to continue production without receiving the area-based support.				0.8959
3	Willingness to continue production without purchasing guaranty.				0.8747
4	Willingness to continue production without receiving any credit or loans from banks and cooperatives.				0.7028

[a] The factor scores for farmers' perceptions of sustainable agriculture were calculated as Mean= 3.73 (SD= 0.75) for Factor 1- Policy factors, Mean= 4.21 (SD= 0.68) for Factor 2- Social factors, Mean= 3.58 (SD= 0.84) for Factor 3- Environmental factors, and Mean= 2.65 (SD = 1.23) for Factor 4– Economic factors. Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization: Rotation converged in 5 iterations.

Definition of Socio-Economic Characteristics and Communication Behavior Variables

Table 2 describes the variables that entered the ordinary logistic model. Considering the frequency distribution of the responses, the explanatory variables were converted to dichotomous variables to interpret easily. Table 2 shows that 60% of the farmers had a farm size smaller than 8.5 decares (10

decares= 1 hectare), which was calculated as the average farm size in the region. The average age of farmers was 48, 50% were older than this age while 50% were younger. Half of the respondents had an elementary school degree, while the other half had some more education beyond elementary school. Sixty percent of the farm families had some members who graduated from college. Regarding land tenure, 80% of the respondents operated their farms and the remaining 20% worked on a shareholding base.

Half of the farmers met with extension personnel's several times per month, while the other half met with the same personals more seldom. Similarly, 50% of the respondents participated in farming-related events and the remaining 50% never attended. Eighty percent watched television every day, 60% read the newspaper several times a week, and finally, 50% used the internet several times a week.

The dependent variable was created from the sustainable perception index as farmers in the lower perception category (17.4% of total farmers), medium perception category (29.7% of total farmers), and higher perception category (52.9% of total farmers).

Factors Influencing Farmers' Perception of Sustainable Agriculture in Rize Province

Results of the ordered regression model are presented in Table 3. All of the variables had the expected signs. The Chi-square coefficient of the model (151.11 with 10 degrees of freedom) was statistically significant at the 0.01 level of probability. There was a natural ordering among the three categories of the dependent variable.

The estimated coefficient values of the ten independent variables included in the model were tested by the t-values of the ordered probit model. Of the ten explanatory variables that entered the model five (3 socioeconomic variables, and two communication behavior variables) were statistically significant at a 0.05 level of probability. The first significant variable was the age of farmers indicating that as the age of farmers increases their perceptions of sustainable agriculture decrease. Gamon (1998) also explained that young producers have a positive perception of sustainable farming. In other words, the younger farmers are more likely to expect a higher perception of sustainable agriculture than older farmers. The second significant variable was the education level of farmers, indicating that as the education level of farmers goes up their perceptions of sustainable agriculture increase. AL-Subaiee *et al*. (2005) reported the positive result regarding education in the case of analyzing extension agents' perception of sustainable agriculture about some farming practices. They explained the highly educated agents were significantly different in their perception of sustainable agriculture. Van Thanh (2017), Tatlıdil *et al*. (2009), and Farougue (2007) described the positive effect of education on farmers' perception of sustainable agriculture. Moreover, as the farmer participated in farming events such as conferences, symposiums, and workshops (Muhamadi and Boz, 2021) and receive extension services (Kabir and Rainis, 2012; Tatlıdil *et al*., 2009) their perception of sustainable agriculture increases. This explains the importance of organizing these types of events in rural areas and promoting farmers' participation. Among communication behavior variables, the frequency of watching television and the frequency of using the internet were found to significantly affect the perception of sustainable agriculture. If different agricultural programs regarding new technologies are broadcasted on television, they may have positive and sustainable effects on farmers' perception of sustainable agriculture. Van Thanh (2017) reported the positive effect of television programs on the perception of sustainable agriculture among banana growers.

Table 2. Variables that entered the ordinary logistic regression model and descriptive statistics.

	Explanatory variables	Number	%
1	Farm size		
	8.50 decares or larger= 1	55	40.0
	Smaller than 8.50 decares= 0	83	60.0
	Total	138	100.0
2	Age of farmer		
	48 or older	69	50.00
	Younger than 48	69	50.0
	Total	138	100.0
3	Education level		
	Beyond elementary=1	69	50.0
	Elementary= 0	69	50.0
	Total	138	100.0
4	Family members having a college education		
	Yes	83	60.0
	No	55	40.0
	Total	138	100.0
5	Status of land tenure		
	Owned farm= 1	110	80.0
	Shareholder farming= 0	28	20.0
	Total	138	100.0
6	Meeting with extension personnel		
	Several times a month= 1	69	50.0
	More seldom= 0	69	50.0
	Total	138	100.0
7	Participation in farming events (conferences, symposiums and training workshops)		
	Yes= 1	69	50
	No= 0	69	50
	Total	138	100.0
8	Watching television		
	Daily= 1	110	80.0
	More seldom = 0	28	20.0
	Total	138	100.0
9	The frequency of reading newspapers		
	Several times a week= 1	83	60.0
	More seldom= 0	55	40.0
	Total	138	100.0
10	Frequency using the internet		
	Several times a week=1	69	50.0
	Never= 0	69	50.0
	Total	138	100.0
	Dependent variable		
	Low level perception= 0	24	17.4
	Medium level perception= 1	41	29.7
	High level perception= 2	73	52.9
	Total	138	100.0

Table. 3. Results of the ordinary probit regression model.

Variables	Coef	Std Err	z	P> |z|
Farm size	0.80	0.53	1.49	0.14
Age of farmer	-4.93	0.77	-6.36	0.00*
The education level of farmer	1.18	0.54	2.17	0.03**
Number of universities graduated family members	0.74	0.52	1.42	0.16
Status of land tenure	0.63	0.68	0.94	0.35
Meeting frequency with extension personnel	0.54	0.53	1.02	0.31
Participation in farming events (conferences symposiums and workshops)	1.53	0.58	2.62	0.01*
The frequency of watching television.	1.93	0.61	3.14	0.01*
The frequency of reading newspapers	0.58	0.52	1.10	0.27
The frequency of using the internet	1.20	0.50	2.39	0.02**

* Shows coefficient with P< 0.01, ** Coefficient with P< 0.05, N= 138; Log likelihood -62.674; LR $\chi 2$ (10)= 151.11; P> χ^2= 0.000; Pseudo R^2= 0.55.

Table 4 explains the marginal effects of all independent variables. The values of marginal effects summed up to zero. The marginal effect of age indicates that when a farmer turns older, his/her probability of being in the higher perception category decreases by 1.19%. However, the probability of being in the medium perception category increases by 1.12% and the probability of being in the lower perception category by 0.07%. The marginal effect of education describes that, if a farmer has a higher education level, the likelihood of being in the higher perception category increases by 0.28%, while the likelihood of being in the medium perception category decreases by 0.26%, and the likelihood of being in the lower perception category decreases by 0.02%. The marginal effect of participation in farming events denotes that farmers participating in farming events have 0.37% higher chance of belonging to the higher perception category, 0.35% smaller probability of belonging to the medium perception category, and 0.02% less likelihood of being in the lower perception category.

Farmers who frequently watched television had a 0.47% greater probability of being high perception level, 0.44% less chance of belonging to moderate perception level, and 0.03% less chance of being in low perception level. Similarly, if a farmer regularly uses the internet, his/her chance of belonging to the high perception level increases by 0.29%, belonging to the medium perception level decreases by 0.27%, and belonging to the low perception level decreases by 0.02%.

Table 4. Marginal effects of the explanatory variables.

Variables	Lower perception category farmers	Medium perception category farmers	Higher perception category farmers
Farm size	-0.01	-0.18	0.19
Age of farmer	0.07	1.12	-1.19
The education level of farmer	-0.02	-0.26	0.28
Number of universities graduated family members	-0.01	-0.17	0.18
Status of land tenure	-0.01	-0.14	0.15
Meeting frequency with extension personnel	-0.01	-0.12	0.13
Participation in farming events (Conferences symposium and workshops)	-0.02	-0.35	0.37
The frequency of watching television.	-0.03	-0.44	0.47
The frequency of reading newspapers	-0.01	-0.13	0.14
The frequency of using the internet	-0.02	-0.27	0.29

CONCLUSIONS

The purpose of this study was to analyze the influence of socioeconomic and communication behavior variables on the farmers' perception of sustainable agriculture among tea-producing farmers in Rize Province, Turkey.

Results of this study showed that to increase sustainability and enhance the perceptions of tea farmers regarding this concept in the locality, sustainability issues can be taken into consideration in four dimensions, namely, policy, social, environmental, and economic dimensions. When developing local programs to increase sustainability, all of these four dimensions must be taken into account to determine program objectives.

Of the ten explanatory variables that entered the model, five (three socioeconomic and two communication variables) significantly affected the farmers' perception level. The first variable was age, which had a negative effect on the perception level of farmers regarding sustainable agriculture. It may imply that the younger farmers are more likely to have high sustainability perception as compared to older farmers. Education level, participation in farming events (conferences, symposiums, and workshops), the frequency of watching television, and frequency of using the internet had a positive

and significant effect on farmers' perception level.

The higher perception of sustainable agriculture among farmers may help the Ministry of Agriculture and Forestry to plan and implement relevant programs. Since more than half of the farmers had a higher perception level as compared to other farmers, it can be stated that farmers in the locality had a positive tendency of perceiving sustainable agriculture. As the most critical factor regarding the perception of sustainable agriculture was the policy factor. The government authorities should take the initiative to increase sustainability in the region. First, the quality of tea products should be improved to meet the requirements of domestic and foreign customers. Unless this issue is solved, Turkish customers, particularly in the South Eastern and Mediterranean regions, will continue to be addicted to international brands of tea products, which will ultimately weaken the domestic tea sector.

Regarding the items included in the social factor, excellent communication and relationships must be developed among all stakeholders involved in the tea sector, which includes the producer families, shareholders, foreign workers, personnel of tea processing factories, and the staff of the extension service operating under the Ministry of Agriculture and Forestry. Since these items constructed the social factor of the sustainable agriculture perception index, they are all crucial to be addressed by policymakers. Making tea farming a sustainable livelihood will move the tea sector from a technocratic structure to a socially acceptable situation. Since the technocratic structure is centered on central government and tries to find solutions for rural issues through a top-down approach, many times it ignores the questions and concerns raised by other related stakeholders of the tea sector in the locality. Therefore, the results of this study suggest that all dimensions of sustainable agriculture, particularly the social dimension, should be given special priority.

The same thing applies to the environmental factor, which also covered several significant items crucial for sustainable tea production. If environmental risks are minimized in the region, farmers will be able to continue their production and apply new technologies. Especially, keeping the land unity, preventing erosion and landslides, practicing trenches, appropriately selecting the routes of power and roads, gas and water pipelines, and other rural facilities will strengthen environmental sustainability. Finally, economic sustainability is essential for tea farmers who have very limited opportunities to make their lives in nonfarm sectors. Therefore, they need to earn a stable income from their tea orchards and do not want to be dependent on government subsidies and financial support.

Since the most important inputs for tea production in the locality are chemical fertilizers and labor, farmers' easier and cheaper access to these inputs will probably lower their production costs and increase income. The government has already given subsidies for chemical fertilizers and organic tea farming in special areas in the last decade; however, these cannot regulate the market and provide excellent opportunities for all stakeholders involved in the tea sector. If family members are not involved in tea cultivation, particularly in the harvest season, labor costs increase too much, which in the end leads to higher tea prices for consumers. The recent trends show that farmers from the region are migrating to large cities, and it will not be possible for them to continue their business without employing foreign labor. All these issues must be taken into consideration by governmental authorities to extend sustainable agriculture among tea farmers in the region.

It is recommended that policymakers should focus on tea-related policy issues such as prevention of illegal tea entries, fast and sound system of purchasing and processing harvested green leaves, and excellent price support, etc. Especially, the illegal tea imports from the Asian markets reduce the competition power of national tea brands. For

this reason, proper measures should be taken at the border gates and borderlines. The agricultural local extension departments should arrange informal vocational education programs or workshops for the tea growers in the study area to increase the farmers' perception of sustainable tea farming. The agricultural programs on television should be broadcasted, which is the highly used communication source everywhere. Since the other important source of acquiring information about tea production is the internet, local firms like Çaykur should provide technical information on its site that can be easily accessed by the tea growers.

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سنجش پنداشت چایکاران از کشاورزی پایدار و عوامل مؤثر بر این پنداشت در استان Rize ترکیه

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چکیده

کشاورزی پایدار به شدت به فعالیت های کشاورزان و توانایی آنها در استفاده موثر از دانش و

اطلاعاتشان برای تصمیم گیری بستگی دارد. بنابراین، برای ارتقای کشاورزی پایدار، پنداشت و درک کشاورزان نیازمند تغییر از رویکرد تکنوکراتیک به رویکرد اجتماعی است. این پژوهش با هدف تحلیل پنداشت چایکاران از کشاورزی پایدار در استان Rize انجام شد. به این منظور،برای آگاهی از دیدگاه چایکاران در مورد شیوه های کشاورزی پایدار که از پیش تعریف شده بود، با یک نمونه طبقه بندی شده شامل ۱۳۸ چایکار تماس گرفته شد. در مجموع ۶۰ گویه (item) تجزیه و تحلیل عاملی شد(factor analyzed) و در آخر، در چهار عامل اصلی یعنی سیاست گذاری، اجتماعی، زیست محیطی و اقتصادی، ۳۳ گویه برای تهیه نمایه یا شاخص پنداشت پایداری شناسایی شد. با در نظر گرفتن امتیاز این نمایه، پنداشت کشاورزان به سه گروه پنداشت پایین، متوسط و سطح بالا تقسیم شد. متغیرهای توضیحی (explanatory variables) از بین ویژگی های اجتماعی-اقتصادی و رفتار ارتباطی کشاورزان انتخاب شد. نتایج مدل نشان داد که سطح تحصیلات، سن، شرکت در رویدادهای کشاورزی، تماشای تلویزیون و استفاده از اینترنت بر پنداشت کشاورزان از کشاورزی پایدار در منطقه تأثیر گذاشته است. بنا بر این، با بر گذاری کارگاه های مناسب، مسولین دولتی باید روی موضوعات مرتبط با سیاست گذاری مانند ورود غیرقانونی چای، عوامل اجتماعی مانند افزایش سطح ارتباط بین ذینفعان و اجتماعی شدن آنها، و مشکلات زیست محیطی ناشی از عملیات زراعی تمرکز کند.